HELMINTHOSPORIUM SPOT OF CITRONELLA AND LEMON GRASS IN GUATEMALA

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During August, 1941, a severe epiphytotic developed on citronella *(Cymbopogon Nardus* (L.) Rendle subspec. *genuinus)* and lemon grass *(Cymbopogon citratus* (DC.) Stapf) at Los Cerritos, a very large plantation near the upper edge of the coastal plain below Escuintla in Guatemala. The weather had been somewhat abnormal, with earlier light rains and higher humidities at the end of the preceding dry season, although the rainfall for the whole subsequent rainy season was not conspicuously high. Owing to the increased demand for essential oils, the plantation had been irrigated throughout the dry season instead of cutting off the water for the last two or three months as in previous years. This kept the trash and marcescent leaves at the bases of the plants moist for the production of a larger number of spores while the higher humidities probably aided in securing more abundant germination and infection. By the end of August all but the very young leaves had died back about half their length, and the distilling plant was closed for about six weeks for the first time since the plantation came into production about ten years before.

An examination of a large number of plants showed that the principal damage resulted from a leaf spot, although an occasional plant of citronella showed a rot associated with *Fusarium* sp. at the bases of the stems a short distance above the soil. The leaf spot begins as a small yellowish area between the veins. It develops more rapidly between the veins than across the smaller ones, resulting in an elliptic to nearly linear area of necrosis with a reddish margin, quite similar in appearance to the *Helminthosporium* leaf spot of sugar cane. The central portion soon becomes brown and dry, but does not drop out. As the spots increase in number, evidently the water supply is reduced and the distal portion of the leaf slowly

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wilts and dies. Transverse sections of the leaf through a leaf spot apparently show cross-sections of thick-walled, brownish hyphae in the phloem of the bundle next the leaf spot, with the whole phloem area brown and necrotic. The dead tissue may then be invaded by saprophytes such as *Hormodendrum*.

The *Helminthosporium* was easily isolated on Thaxter's potato-glucose agar and grows equally well on Sabouraud's glucose agar, although on both media the spores are somewhat smaller (24–35 × 8–15.5 μ, average 29.5 × 12.4 μ) than when developed on the host (46–54 × 18–24 μ, average 49 × 20 μ). The strain on lemon grass has somewhat smaller spores (19.5–28.6 × 7–15 μ, average 25.8 × 10 μ) than those of the citronella strain, but further study will be necessary to determine whether the difference is significant as no morphological differences have been noticed.

On the host, the conidia develop at the tip of a short, stiff conidiophore. As the first spore develops, the supporting cell proliferates dichotomously and produces a second spore. This may be repeated, giving about three spores in a compact group at the tip of the conidiophore as in *Acrothecium* (pl. 13, fig. 8). The mature spore is asymmetric, flattened on one side or somewhat curved, with one cell (usually the subterminal) much larger than the others.

In agar colonies, conidia are borne singly, both terminally and laterally (pl. 13, figs. 5, 10, 11), as well as in a terminal group on short lateral branches corresponding to the conidiophores on the host (pl. 13, figs. 6, 11). In the original cultures on potato-glucose agar, the large subterminal cell of the conidium often proliferated laterally, producing a mature spore suggestive of the staurospore found in *Triposporium* Corda (pl. 13, figs. 4, 6, 11). This type of spore has not been seen in subcultures on Sabouraud's glucose agar, prepared from the original cultures after six months.

The systematic position of this organism is not altogether clear from the limited literature at my disposal. The staurospores are considered as abnormal since I have found them only in cultures on potato-glucose agar, and may result from some morphogenetic stimulus in the medium. The grouping of spores at the tip of the conidiophore suggests *Acrothecium* Preuss but is believed to result from a different ontogeny, similar to that of *Helminthosporium Sacchari* (Breda da Haan) Butler, if the internodes between spores were greatly shortened and the spores were less caducous. *Brachysporium* Saccardo and *Napicladium* Thuemen resemble our organism in many respects, but their distinction from *Helmintho-*

sporium Link is not clear. Hence in the absence of further information regarding this group of genera, I have preferred to describe the species in the oldest genus.

HELMINTHOSPORIUM **Cymbopogi** Dodge, sp. nov.

Conidiophori rigidi, erecti, fumosi vel obscure brunnei, septati neque ad septa constricti neque ramificati; conidia 3–5-septata, terminalia, singula vel in capitulis parvis, asymmetrica, uno latere applanata aut leviter curvata, 46–54 × 18–24 μ.

Conidiophores rigid, erect, smoky or dark brown, septate, not constricted at the septa nor branched; conidia with 3–5 thick, transverse septa, terminal, single or in small groups, asymmetric, flattened on one side or slightly curved, thick-walled, usually with the penultimate cell much larger than the others, 46–54 × 18–24 μ.

Guatemala: Escuintla, Los Cerritos, *Dodge,* on citronella, TYPE; same locality and collector, on lemon grass.

The spore germinates from the basal cell by a tube which pushes between the epidermal cells until it is below the thicker portion of the wall of the host cell, then penetrates the epidermal cell (pl. 13, fig. 7). If the tube fails to penetrate, it forms a dichotomously branched mycelium (pl. 13, figs. 1, 9).

Preliminary experiments indicate that this disease may be controlled by spraying with either Bordeaux mixture or lime-sulfur. A promising beginning has been made in the selection of resistant clones. Two clones with a relatively small amount of infection in a very heavily infected area were selected, divided into the usual seed bits and planted in a freshly prepared section of the plantation. As they mature for the first cutting, about half of them are relatively free from infection. The other half and the surrounding area are again heavily infected, as this area has not yet been sprayed owing to lack of adequate equipment for spraying such a large plantation. It is hoped to carry this selection further, since in normal times the cost of spraying is so great that it will be impossible for Guatemalan farmers to compete with those in other regions with much lower labor costs.

EXPLANATION OF PLATE

PLATE 13

Fig. 1. Germinating spore of *Helminthosporium Cymbopogi* Dodge, strain on citronella.

Fig. 2. Terminal group of conidia, strain on lemon grass, from cultures.

Fig. 3. Younger stage of the above. The older spore on the right has already thickened its walls, while the younger one on the left has just produced transverse septa.

Fig. 4. Conidia of the strain on lemon grass from potato-glucose agar culture.

Fig. 5. Single terminal conidium of the strain on lemon grass from potato-glucose agar culture.

Fig. 6. Group of conidia, strain on lemon grass from potato-glucose agar culture. This hypha is more moniliform than the usual hyphae in cultures.

Fig. 7. Germinating conidium, showing method of penetration of the citronella leaf epidermis.

Fig. 8. Conidiophore and group of conidia on leaf of citronella.

Fig. 9. Germinating conidium of lemon grass strain from culture.

Fig. 10. Very young terminal group of conidia of lemon grass strain; only the first spore has thickened its walls, the second spore has divided only once, while the two youngest spores have not begun to divide. A young spore is forming laterally below.

Fig. 11. Various types and groupings of conidia of the citronella strain from potato-glucose agar culture along a single hypha.